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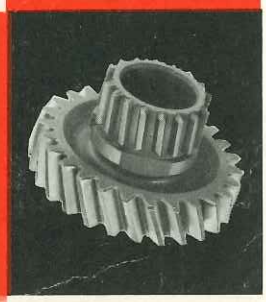
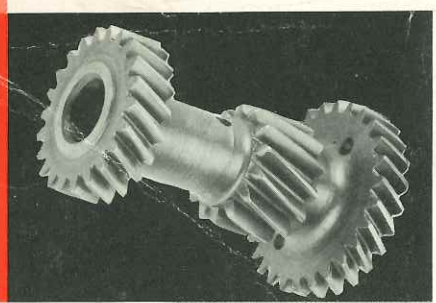
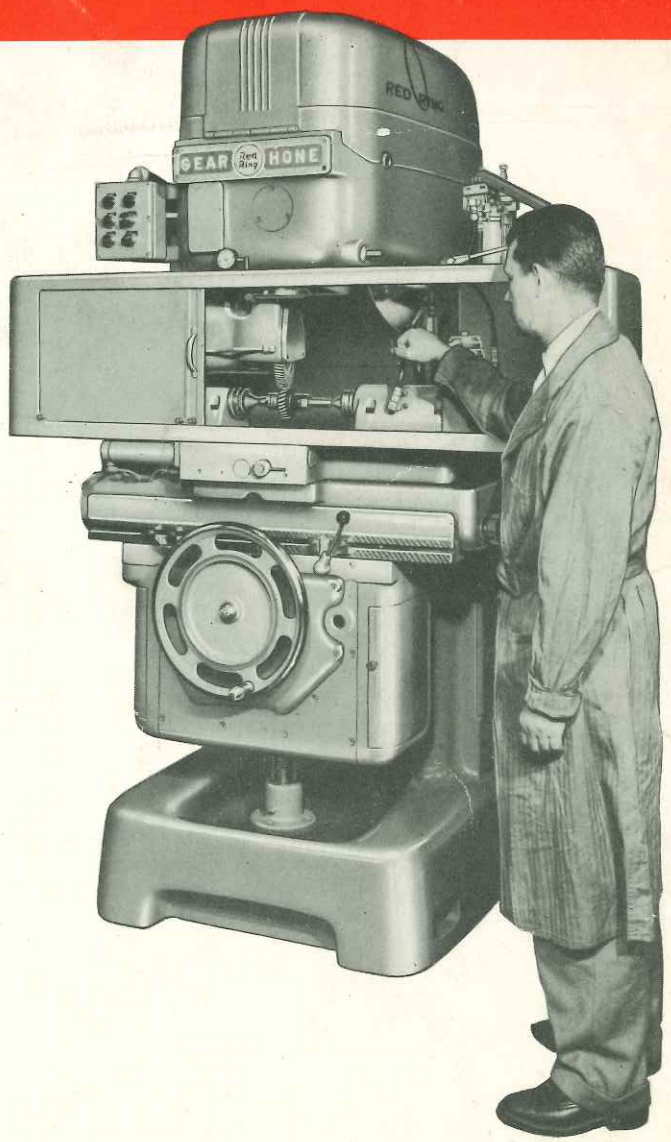




GEAR HONING

THE BEST METHOD OF PRODUCING

QUIET GEARS



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

QUIET GEARS

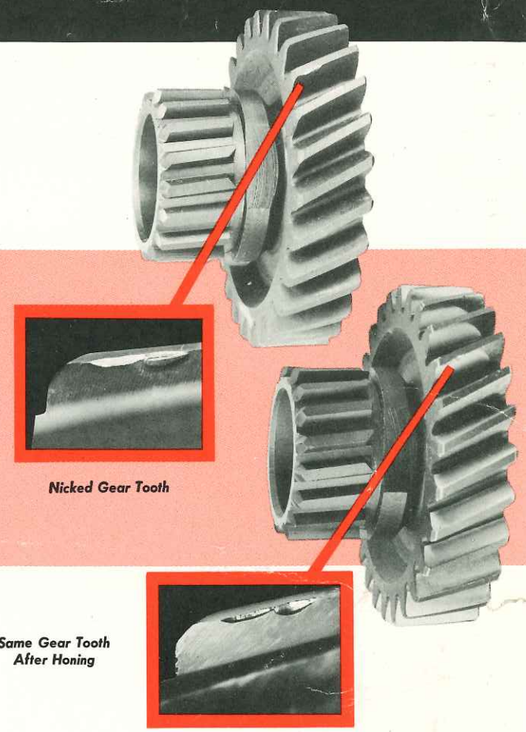
PRODUCED BY NEW PROCESS AT LESS COST

Hard-Gear tooth honing*, a gear finishing process is an entirely new and much more effective approach to the vexing problem of gear noise caused by nicks, burrs, tooth roughness and minor heat-treat distortions.

*Patents Pending

Gear honing accomplishes four essential results:

- **It smooths off the swaged or raised metal surrounding tooth nicks**
- **It eliminates burrs**
- **It materially improves surface finish**
- **It corrects minor heat-treat distortions in tooth profile, tooth spacing, lead and pitch diameter runout.**



Nicked Gear Tooth

Same Gear Tooth After Honing

Gear shaving as it became established, practically out-moded such machining practices as gear grinding, burnishing and lapping. The chief reason was the better tooth surfaces and the accurate control shaving provided in compensating for heat-treat distortion.

However, the recent trend to higher gear speeds and more compact gear assemblies has stressed the need for even greater precision in gear characteristics. Furthermore, mass production methods have contributed to a greater prevalence of gear tooth nicks.

To meet these challenges, Red Ring engineers have developed this new and highly effective process of Gear Honing to follow heat-treatment.

MECHANICS OF GEAR HONING

The honing tool is a relatively hard abrasive-impregnated plastic gear manufactured to very close tolerances and dimensionally stabilized.

The honing tool drives the work gear at high speed in a crossed axes relationship as the latter is traversed back and forth in a path parallel to its axis. The cycle includes rotation in both directions with a wetting type honing coolant to flush away the minute metal particles from the honed surfaces.

The result is an accurate tooth generating action which corrects minor profile, tooth spacing, lead and eccentricity errors while at the same time smoothing out nicks and improving surface finish.

The abrasive impregnant may vary in grain size depending on the amount of stock to be removed and the surface finish desired. Honing will remove up to .002″ of stock over pins and attain surface finishes to the order of 10 mu-in.

A honing cycle of less than a minute has been sufficient for the consistent production of acceptable low sound-level automotive gears.

Small pinions are honed at speeds up to 3000 rpm while larger gears are processed at about 1000 surface feet per minute.

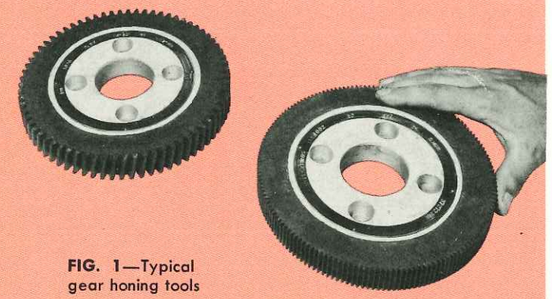


FIG. 1—Typical gear honing tools

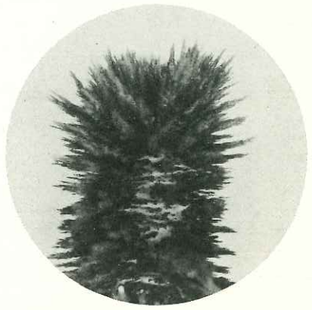


FIG. 2—Honing particles in a magnetic field, approximately 5x size

NICKS AND ECONOMICS

Since there is no practical way to prevent tooth nicks or to predict their occurrence, nick testing has become standard practice in the production of low sound-level gears. Nicked gears isolated by this test are then corrected—usually with a pencil grinder. Admittedly, this is a high cost hand operation.

Gear honing eliminates nick testing and costly hand grinding at a small fraction of their costs. And, in addition, it eliminates other causes of gear noise such as tooth roughness and minor heat-treat distortions. Consequently, when used as a standard production operation for all gears, it reduces over-all production costs.

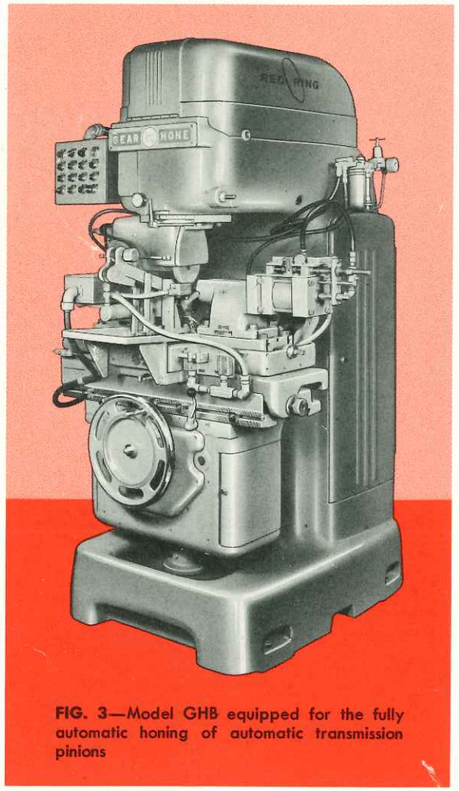


FIG. 3—Model GHB equipped for the fully automatic honing of automatic transmission pinions

GEAR HONING HAS NONE OF THE LIMITATIONS OF FORMER HARD FINISHING PROCESSES

A hard gear can be honed in a small fraction of the time it takes to grind it.

Honing doesn't raise the temperature of the tooth surfaces to produce heat checks or burning. It doesn't change the hardness of the tooth metal—no soft skin.

It leaves the metallurgical structure of the metal just as it was when it came from heat-treatment.

Honing does not cold work tooth metal as does burnishing—no internal stresses to spring the teeth back into incorrect form when those stresses are gradually relieved under service conditions.

Honing is not only much faster and less costly than lapping but it also improves the gear tooth elements.

The very high speed of the honing process knocks off all "plus tips and ends" in both involute and lead.

APPLYING THE GEAR HONING PROCESS

Honing is applicable to both long and short production runs—and economical for both.

Honing is not offered as a substitute for any of the conventional gear cutting operations. Good gear teeth have to be generated and shaved before hardening to bring post heat-treat corrections within feasible limits.

After heat-treatment, locating surfaces (bore and faces) are finished according to standard practice. Honing is the final finishing operation before the gears are sent to assembly.

RED RING GEAR HONING MACHINES

Red Ring Gear Honing Machines in two sizes are now available. An important feature of these honing machines is a specially designed high speed drive which develops work speeds up to 3000 rpm.

The super-precision spindle bearings are lubricated by a unique method of pressure mist lubrication which assures constant flushing but without any escape of the mist into the surrounding air. The latter is accomplished by completely trapping any exhaust mist in the generous flood of honing coolant. The lubrication and coolant systems are entirely separate.

MODEL GHB—8″ and 12″

Model GHB hones gears up to 12 P.D. having either the conventional or crowned tooth forms.

Another unique feature of the Model GHB is a patented zero-backlash tilting table. This table which carries the headstock and air-powered tailstock is hinged at the rear to the reciprocating work table. Thus the work carrying centers can be lowered (manually or automatically) to receive the work; then swung upward into zero-backlash and locked for the honing cycle.

If desired, the tilting mechanism can be locked in a fixed position and the machine used for low-backlash honing. Loading may be manual, semi-automatic or full-automatic as desired.

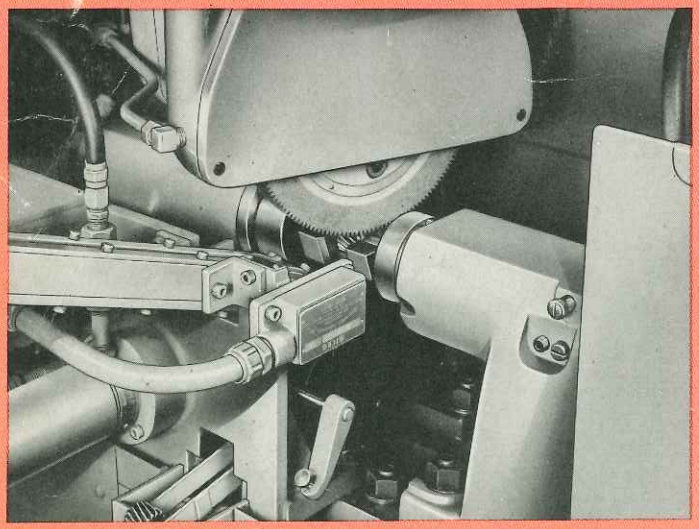


FIG. 4—Work gear in honing position

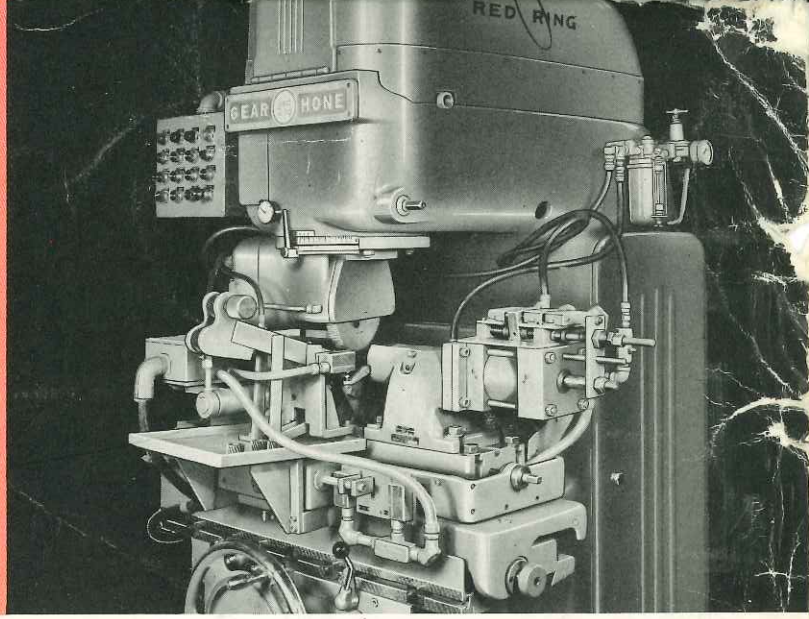


FIG. 5—Red Ring air powered rocker-type automatic loader on Model GHB

RECOMMENDED PRACTICE

Manual Operation is most economical when a number of different parts are to be honed on the same machine.

Semi-Automatic Operation is essentially the same as fully automatic operation except that it does not include a magazine and loader. Consequently, the installation cost is less than for full automation.

In many cases semi-automatic production rates are equal to those for fully automatic operation since one operator can service several machines.

With semi-automatic operation a change in a work part requires only minor tooling changes.

Fully Automatic Operation is used when a large volume continuous run of a single work part is contemplated. Here, magazine, loader and conveyors are specially designed for that particular part.

CAPACITIES

Model	GHB-8″	GHB-12″
Work Gear, Pitch Dia.	1″ to 8″	1″ to 12″
Work Gear, Max. O.D.	8¾″	12¾″
Work Gear, Diametral Pitch	4 to 20	4 to 20
Table Stroke, Max.	6″	6″
Length Between Centers, Max.	17½″	16″

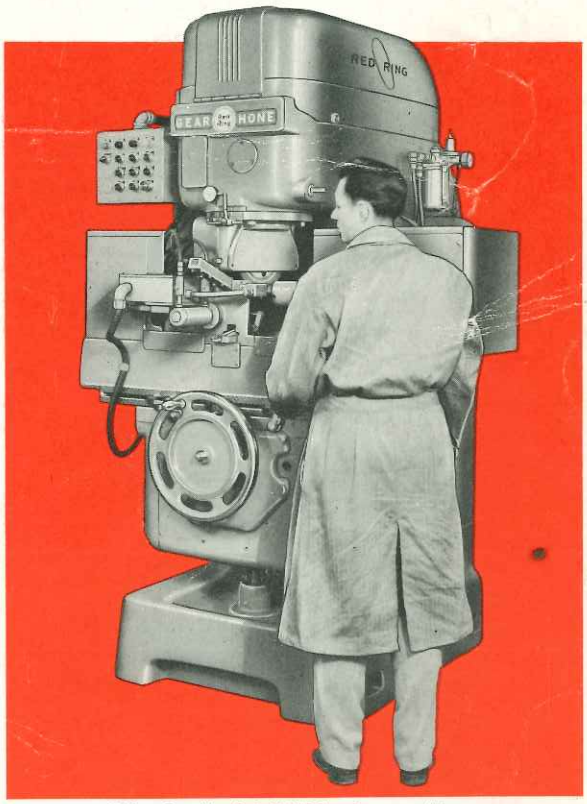


FIG. 6—Model GHB honing machine

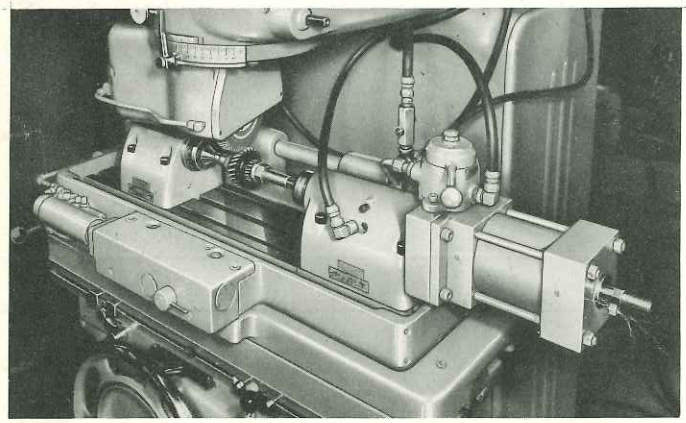


FIG. 7—Tailstock of the Model GHB (manual loading) is controlled by the manual air valve above the air cylinder at the right. Tilting the table for loading and unloading is handled by the manual air valve under the cylinder at the left side of the table. The hinge mounting for the tilting table is visable behind the work gear.

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